

REMARKS

In response to the Office Action dated February 2, 2010, claims 1, 10 and 15 have been amended and claim 16 has been cancelled. Claim 1 is the sole independent claim.

Adequate descriptive support for the present Amendment should be apparent throughout the originally filed disclosure as, for example, the depicted embodiments and related discussion thereof in the written description of the specification. Applicants submit that the present Amendment does not generate any new matter issue. Entry of the present Amendment is respectfully solicited. It is believed that this response places this case in condition for allowance. Hence, prompt favorable reconsideration of this case is solicited.

Claims 1-5, 8, 11 and 13-15 were rejected under 35 U.S.C. § 103(a) as obvious over Imai et al. (U.S. Pat. No. 5,001,452, hereinafter “Imai”) in view of Yoshida (U.S. Pat. No. 6,340,393, hereinafter “Yoshida”). Applicants respectfully traverse the rejection.

Dependent claims 7, 10 and 16 were rejected under 35 U.S.C. § 103(a) as obvious over Imai in view of Yoshida and further in view of Hasegawa et al. (U.S. Patent App. Pub. No. 2002/0127405, hereinafter “Hasegawa”). Applicants respectfully traverse.

Dependent claim 12 was rejected under 35 U.S.C. § 103(a) as obvious over Imai in view of Yoshida and further in view of Shiomi et al. (U.S. Pat. No. 5,252,840, hereinafter “Shiomi”). Applicants respectfully traverse.

By the above amendment, independent claim 1 is directed to:

A diamond n-type semiconductor comprising a first diamond semiconductor which has n-type conduction and in which a distortion or defect is artificially formed,

wherein said first diamond semiconductor contains at least one kind donor element of  $5 \times 10^{19} \text{ cm}^{-3}$  or more in total and an impurity element other than the donor element, the contained amount of the impurity element being lower than the total contained amount of the donor element,

whereby said first diamond semiconductor has an n-type dopant concentration adjusted by vapor-phase growth such that an electron concentration of said first diamond semiconductor exhibits a negative correlation with temperature, in a temperature range

having a width of 100°C or more and included within a temperature region from 0°C to 300°C a diamond n-type semiconductor and a manufacturing method thereof characterized by a diamond semiconductor which has a n-type conductivity and in which distortion is artificially formed, and

wherein the impurity element is Si locally existing in said first diamond semiconductor as a material for restraining the deterioration of diamond crystallinity caused by the doping of the donor element.

Claim 1 now recites features of claim 10. Yoshida was relied upon in the Office Action as allegedly disclosing that the contained amount of the impurity element is lower than the total contained amount of the donor element. Hasegawa was cited for allegedly disclosing a specific impurity element and its contained amount. Reconsideration and withdrawal of the rejection

Amended claim 1 describes “Si” as an impurity element to be doped in the n-type diamond semiconductor. As described in paragraph [0039] of the present specification, “Si” of the claimed impurity element is introduced in the n-type diamond semiconductor in order to dope with a large amount of the donor element while restraining the crystallinity of diamond from deteriorating, and then “Si” locally exists in the claimed first diamond semiconductor as a silicon carbide. In other words, when both “Si” and a donor element are doped with a diamond, under specific conditions, as recited in claim 1, “Si” locally exists in the n-type diamond semiconductor. In particular, fabricating a diamond by a vapor-phase growth while doping a large amount of donor element (more specifically, a case of fabricating a diamond containing at least one kind of donor element of  $5 \times 10^{19} \text{ cm}^{-3}$  or more in total, as recited in claim 1) is what is referred to as the specific conditions. For example, the effect of enabling very-high-concentration doping with the donor element appears at a P/C (i.e. a ratio between the number of phosphorous atoms and the number of carbon atoms) of at least 5,000 ppm in a vapor phase when making a phosphorous-doped (p-doped) diamond semiconductor by vapor phase growth.

As described above, it should be clear that “Si” of the claimed impurity element is not introduced as an impurity element for controlling a diamond conductivity as disclosed in Hasegawa ([0037], and therefore, the claimed subject matter as a whole is not disclosed or suggested in the applied prior art and is clearly distinguishable from Yoshida and Hasegawa.

In particular, as indicated in the Office Action, Yoshida teaches the relationship between the contained amounts of the donor element and the acceptor element, but it should be evident the “Si” of the present claimed impurity element does not become an acceptor element. Thus, Yoshida should not be applied against the present claimed subject matter. Moreover, Hasegawa teaches that “Si” as an acceptor and that it can be used as an impurity element for controlling a diamond conductivity. See Hasegawa at [0037]. The Examiner’s indicated motivation for combining Yoshida and Hasegawa is improperly predicated upon hindsight since the motivation is based on the concept of using “Si” as a material for controlling a diamond conductivity. The rejection is not legally viable for at least this additional reason.

The present claimed structure cannot be realized even if Imai, Hasegawa, Yoshida and Shiomi are combined as suggested by the Examiner. As such, the foregoing rejections are not legally viable and should be withdrawn.

Under Federal Circuit guidelines, a dependent claim is allowable if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Thus, as independent claim 1 is allowable for the reasons set forth above, it is respectfully submitted that the remaining dependent claims are allowable for at least the same reasons as the base claim.

Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues

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that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call the undersigned attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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